Security Mesh Panel

Field of the Invention

The present invention relates to a security panel, for example for use in a security barrier, and to a method of forming the security panel.

Background

Security barriers are conventionally formed from straight sections of elongated metal tape having barbs formed at spaced intervals along the tape. The metal tape may be traditional barbed wire, which usually comprises two or more braided wires with regularly spaced intertwined wire barbs. Alternatively, the metal tape may be razor wire, which usually has a central wire with laterally extending planar barbs. An example of such razor wire is disclosed in US 4,509,726.

It is known to form metal tape, and particularly razor wire, into a security mesh panel in order to provide a barrier which is both stronger and more secure than a barrier formed purely with elongate parallel strands of metal tape. One such security mesh is disclosed in patent document CA 1,190,433, which shows a security mesh panel formed from straight razor wire that is bent into a saw tooth pattern that interlinks with adjacent saw tooth bent razor wires. The mesh is then riveted or welded at the junctions.

Other types of security mesh panel formed from razor wire are disclosed in US 4,666,129, GB 2,259,722 A, WO 00/65178 and 2,240,351 A, all of which are similar to CA 1,190,433 in that

individual strands of razor wire are joined together by welding or riveting to form a security mesh panel.

A number of problems have been noted with such security mesh panels. First, a large number of individual strands of razor wire have to be formed and aligned relative to one another prior to fixing the strands together. In a production environment, this requires specially designed machinery both to manipulate and join the stands. Second, although in principle it is possible to make a weld or rivet as strong as the surrounding material, in practice each join is a potential source of weakness. For example, a weld may not have been formed in the optimum manner. Both welds and rivets are a potential source of corrosion, either from the use of differing types of metals in the same structure, or from damage done to a galvanized protective finish on the original razor wire.

One solution to the latter problem is to form the razor wire from stainless steel, but this is a prohibitively expensive material to use in many applications, particularly perimeter fencing formed from the security mesh panels.

It is an object of the present invention to provide a security mesh panel that deals with these issues.

Summary of the Invention

According to the invention, there is provided security panel, comprising an expanded metal mesh, the mesh having apertures therethrough bounded by a plurality of sides, at least one of said apertures having at least one side to which is affixed a separate barbed structure, the barbed structure having at

least one barb extending in a plane of the panel in towards another side of said aperture.

Because the security panel is formed from an expanded mesh, there is no need for welds or rivets at mesh nodes. The panel therefore has an inherent strength and durability beyond that which may be achieved with a security panel formed from individual lengths of razor wire. Furthermore, there is no need for there to be any welds or other joins between the barbed structures and the mesh at the mesh nodes. Such joins can be made entirely away from the mesh nodes. Therefore, the formation and performance of these joins cannot adversely affect the strength of the mesh at the nodes. Because any stresses on a security panel will tend to be concentrated at one or more of the mesh nodes, the overall strength of the security panel can readily be improved as compared with a security panel having joins between individual pieces of razor wire.

Preferably, the barbed structures are affixed to all sides of said at least one aperture. This helps to provide the maximum number of the barbs projecting into each aperture of the security panel, thereby improving the security of the panel. Furthermore, for the same reason the barbed structure may have a plurality of said barbs extending in the plane of the panel in towards another side of said aperture.

In one preferred embodiment of the invention, the barbed structure includes a plurality of barbed points grouped in threes, a first and a second one of said barbed points extending in opposite directions parallel with the corresponding side of said aperture, and the third one of said barbed points extending transversely away from the

corresponding side of said aperture.

In general, each side of an aperture is formed from an elongate strip of metal, and each of the strips of metal is joined integrally to adjacent strips of metal at mesh nodes. In a preferred embodiment, the barbed structure is then affixed to just one corresponding strip of metal. So that the fixing of the barbed structure does not adversely affect the strength of the mesh nodes, the barbed structure is preferably affixed to this one corresponding strip of metal at one or more points lying between the mesh nodes. Similarly, the barbed structure preferably lies entirely between mesh nodes.

The invention further provides a security fence, comprising at least two upright fence supports, and a security panel, said security panel being supported by said fence supports, wherein the security panel is according to the invention.

Also according to the invention, there is provided a method of forming a security panel, comprising the steps of: making a plurality of non-intersecting cuts in a sheet of metal; expanding the cut sheet to form an expanded metal mesh, the mesh having apertures therethrough bounded by a plurality of sides; forming one or more barbed structures in metal separate from the expanded metal mesh, the or each barbed structure having at least one extending barb; and affixing at least one of said barbed structures to a side of at least one of said apertures so that at least one barb extends in a plane of the panel in towards another side of said aperture.

The method may also comprise the step of affixing the or each barbed structure between a pair of nodes of the metal mesh.

One way of affixing the barbed structure to the metal mesh is to form the barbed structure with at least one extending tab, and then wrap the or each tab around portions of the metal mesh bounding the aperture in order to affix the barbed structure to said side of said aperture.

Additionally or alternatively, the barbed structure may be affixed to the metal mesh by welding the barbed structure to the metal mesh at one or more points between nodes of the metal mesh.

Brief Description of the Drawings

The invention will now be further described, by way of example only, and with reference to the accompanying drawings, in which:

Figure 1 is a plan view of one side of a security mesh panel according to the invention;

Figure 2 is an enlarged plan view of part of the opposite side of the security mesh panel of Figure 1;

Figure 3 is a cross-section view through the security mesh panel, taken along line III-III of Figure 2; and

Figure 4 is a view of a security fence, comprising upright fence supports that support the security panel of Figures 1 to 3.

Detailed Description

Figure 1 shows a plan view of one side of a security mesh panel 1. The security panel 1 is formed from a planar expanded metal mesh 2 to which individual elongate metal barbed structures 4 have been permanently affixed, for example by spot welding. The expanded mesh 2 is itself formed in a conventional manner from a metal sheet, for example 3 mm thick mild steel, galvanized steel or even stainless steel, through which a series of parallel non-overlapping slits have been punched. After the slits have been formed, a pair of opposite edges of the sheet is pulled apart to expand the sheet and form the mesh 2. If the expanded metal sheet requires corrosion protection, then it may be galvanized.

Reference is now made also to Figures 2 and 3, which show respectively an enlarged plan view of a side of the security mesh 2 opposite to that shown in Figure 1, and a cross section view through the security mesh. The mesh 2 consists of a series of adjacent strips of metal 6, which in this example are essentially straight sections. Each straight section 6 is bounded by mesh nodes 8 at which each straight section merges integrally with adjacent straight sections 6. Each mesh node 8 is therefore joined to four adjacent straight sections 6 in an X-pattern, except at an edge 10 of the mesh where each mesh node 8 is joined to two adjacent straight sections 6 in a V-pattern.

The metal mesh 2 therefore presents a number of diamond shaped apertures 9, each of which is bounded by four adjacent sides 11.

Each barbed structure 4 lies entirely between a pair of mesh

nodes 8, which are at opposite ends of a mesh straight section 6. In the present example, there are three such barbed structures between 4 each mesh node 8. There may, however, be one, two, four or any convenient number of such barbed structures 4 between the nodes 8.

The barbed structures 4 are all punched from sheet metal, preferably galvanized steel or stainless steel and then folded along a central axis to form a square U-shaped channel 12 that extends the full length of each barbed structure 4. As can be seen from Figure 3, each straight section 6 has a square cross-section. The cross section may, however, alternatively be rectangular. The cross-section of the straight section has a complementary shape with the U-shaped channel so that each barbed structure 4 is seated securely on a corresponding straight section 6. Each straight section 6 is therefore seated in the channel 12 when the barbed structure 4 is affixed to the corresponding straight section 6.

Each barbed structure 4 is formed with at least one, and preferably two or three barbs 14 along opposite sides of the barbed structure. Here, the barbs 14 are multi-pointed. The number and spacing of the barbs 14 will depend on the relative sizes of the barbs 14 and aperture 9. The barbs 14 each have a pair of barbed points 15, 16 that extend parallel with the length of the U-shaped channel 12 and at a distance from the straight section 6. A third intermediate barbed point 17 extends transversely away from the channel 12 and straight section 6. Each of the barbed points 15, 16, 17 is triangular in plan view and extends in the plane of the security mesh 2 towards another side 11 of the aperture 9.

When the barbed structures 4 are being assembled with the metal mesh 2, the complimentary square shapes of each straight section 6 and corresponding barbed structure 4 help to align the barbed structure 6 with the plane of the metal mesh 2. This greatly simplifies the manufacturing process, as it is not necessary to hold each barbed structure 4 in place prior to permanent affixing of the barbed structure 4 to the corresponding straight section 6.

In order to make each barbed point 15, 16, 17 as sharp as possible, the barbed structure 4 is preferably stamped from relatively thin sheet metal, for example between 0.3 mm and 0.5 mm thick. The barbs 14 should, however, be difficult to bend back by hand, and in order to reinforce each barb 14 against such bending, each barb 14 has a corresponding base portion 18 that extends in the plane of the mesh panel 2 laterally away from the channel 12. Each barb 14 has a central waist 20 from which the three barbed points 15, 16, 17 project and from which the base portion 18 flares outwards towards the channel 12. This arrangement of base portion 18 and waist 20 therefore permits each barb 14 to be spaced at a sufficient distance from the straight section 6 to provide enhanced security, while at the same time diminishing the distance between the waist 20 and the barbed points 15, 16, 17 in order to reduce the amount of leverage that may be applied in an attempt to bend back a barbed point 15, 16, 17.

The outwardly flared shape of the base portion 18 also makes the pair of parallel barbed points 15, 16 more exposed, thus increasing the deterrent effectiveness of these barbed points 15, 16. For this reason, each base portion 18 is distinct from base portions of any adjacent barbs 14.

The effectiveness of each barb 14 is also enhanced if there is a longitudinal spacing between adjacent parallel barbed points 15, 16 at least as great as the lateral spacing of each of these points from the central channel 12. Therefore, it is particularly preferred that each base portion 18 is separated by a gap 22 from adjacent base portions 18.

Furthermore, this arrangement permits the barbed structure 4 to have one or more tabs 24 which wrap around the corresponding straight section 6 to which the barbed structure 4 is affixed. In the illustrated embodiment, there is a pair of such tabs 24 spaced along the length of the corresponding strip of metal 6 and which extend from opposite sides 25, 26 of the channel 12. The tabs 24 enhance the join between the barbed structure 4 and the corresponding straight section 6, and may be wrapped around the straight section 6 prior to welding in order to ensure that each straight section 6 is held securely in place prior to permanent affixing of the barbed structure 4 to the straight section 6.

The tabs 24 may be used to hold the barbed structures 4 to the corresponding straight section 6 prior to welding of the barbed structure to the straight section. In an alternative embodiment, not illustrated in the drawings, the barbed structures 4 have no tabs, but are crimped to the corresponding straight section 6, the crimping being sufficient to hold the barbed structure in place prior to permanent fixing, for example by welding.

The security panel 1 described above may be used in various applications where a panel-type security barrier is needed. The security panel 1 may form only a portion of a security barrier, for example a security strip atop a wall or fence,

or may form all or substantially all of a security barrier. An example of the latter application is illustrated in Figure 4, which shows a security fence 30 comprising at least two upright fence supports 32, which may be secured in the ground 34, with the security panel 1 being supported by the fence supports 32. Because of the solid interconnection between the strips of metal 6 at integral mesh nodes 8, such a security fence 30 is very strong compared with mesh structures in which initially separate strips have been subsequently secured together by welding or riveting.

In summary, there a number of advantages to forming the security panel 1 from an expanded metal mesh 2 to which a number of separate barbed structures 4 are affixed. First of all, the fixing of the barbed structures 4 and the mesh 2 does not adversely affect the strength of the mesh. Corrosion of a metal mesh 2 is a particular problem at mesh nodes, and because each mesh node 8 in the expanded metal mesh 2 is not subject to subsequent welding, riveting or the like, each mesh node 8 will tend to be less susceptible to corrosion. The security panel 1 of the invention therefore does not need to be formed in expensive materials such as stainless steel in order to form a durable security barrier.

The particular form of barbed structure 4 and mesh straight section 6 described above also provides significant advantages, both in terms of the assembly of the structure and the ultimate deterrent value of the security mesh structure.

The invention therefore provides an economical and convenient security panel that may be used in a range of different security applications.